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LIV.—*On the Classification of the Decapod Crustaceans.* By L. A. Borradaile, M.A., Lecturer in Natural Sciences at Selwyn College, Cambridge.

In the following pages proposals as to the classification of the Decapod Crustaceans which I have made in a number of papers during the last few years are stated in a connected form and with certain additions, so as to form a complete conspectus of the higher divisions of the group. I hope that this systematic summary may prove of practical use and that some remarks introductory to those portions of it which have not yet been published will be of service as a contribution to the discussion of vexed questions of phylogeny and classification.

The necessity for keeping the article within reasonable limits has compelled me to choose between the ordinary method of stating the diagnostic characters of the divisions of the classification under headings and that known as a "key." I have adopted the latter as being better suited to bring out the resemblances and contrasts on which a phylogenetic arrangement is based, and because it is of more immediate use to anyone unfamiliar with the group. Questions with which I have dealt elsewhere are not discussed in detail here, but a fuller treatment of them may be found in the origina papers *, especially those in the 'Fauna of the Maldives.'

I.

The true position of the order Decapoda in the Crustacean system is very well shown by Dr. Calman's elaboration of Hansen's classification, published in this Journal in 1904 †. To this classification I would give my adhesion, only pointing out that, if the Crustacea be given rank as a subphylum of the Arthropoda, equivalent to the Arachnoidea, Tracheata, and Prototracheata, the Malacostraca become a class and the Eumalacostraca a subclass.

For our present purposes the most important of the points made by Dr. Calman is the close relationship between the Euphausiacea and the Decapoda. We shall assume that the two orders have a common origin and regard the subdivisions of the Decapoda as primitive in proportion as they approach the Euphausiacea, though it will at the same time be necessary to bear in mind that the Decapods with four rows of gills, representing, as we shall see, both epipodite and proepipodite, cannot be descended from the modern Euphausiaceans, which have only one row.

* "A Revision of the Pontoniidæ," Ann. & Mag. Nat. Hist. (7) ii. pp. 376–391 (1898). [History, affinities, and limits of the (sub-) family, pp. 376–379.]

"On the Stomatopoda and Macrura brought by Dr. Willey from the South Seas," Willey's Zool. Results, iv. pp. 395–428, pls. xxxvi.–xxxix. (1900). [*Palæmonopsis*, a Palæmonid with affinities to Pontoniidæ, p. 410; doubtful validity of Latreutidæ, p. 414.]

"On some Crustaceans from the South Pacific.—Part IV. The Crabs," Proc. Zool. Soc. 1900, pp. 568–596, pls. xl.–xlii. [Primary subdivisions of the Crabs, p. 571; subfamilies of Atelecyclidæ, Cancridæ, and Portunidæ, pp. 575–577.]

"Marine Crustaceans" in Gardiner's 'Fauna and Geography of the Maldive and Laccadive Archipelagoes.'—Part III. The Xanthidæ and some other Crabs, vol. i. pp. 237–271, text-figs. 41–60. [Characters and Classification of Xanthidæ, pp. 237–238.]—Part IV. Some Remarks on the Classification of the Crabs, vol. i. pp. 424–429, text-fig. 110.—Part VI. The Sand-Crabs (Oxystomata), vol. i. pp. 434–439, text-figs. 115–117, pl. xxii. [Characters and Classification of Oxystomata, p. 434.]—Part IX. The Sponge-Crabs (Dromiacea), vol. ii. pp. 574–578, pl. xxxviii. [Characters and classification of Dromiacea, pp. 574–576.]—Part X. The Spider-Crabs (Oxyrhyncha), vol. ii. pp. 681–690, text-figs. 122–126, pl. xlvii. [Characters and classification of Oxyrhyncha, pp. 681, 682.]—Part XI. On the Classification and Genealogy of the Reptant Decapods, vol. ii. pp. 690–698, text-figs. 125, 126, pl. xlviii.—Part XIII. The Hippidea, Thalassinidea, and Scyllaridea, vol. ii. pp. 750–754, pl. lviii. [Characters and classification of the groups.]

"On the Classification of the Thalassinidea," Ann. & Mag. Nat. Hist. (7) xii. pp. 534–551 (1903).

† Ann. & Mag. Hist. (7) xiii. p. 144 (1904).

II.

1. The earliest of the surviving classifications of the Decapoda is that established by Latreille in 1806 *, in which the order is subdivided into MACRURA or "tailed" forms and BRACHYURA or Crabs. Roughly speaking, this division depends on the condition of the abdomen, which in the Macrura is carried at length and in the Brachyura is folded under the thorax. In framing a definition, however, it is not possible to rely on the above criterion, for in the Porcellanidæ, the Hippidea, and the Lithodidæ, which are undoubtedly nearly related to tailed forms, the abdomen is carried as in the Crabs. The absence from the Brachyura of the limbs of the sixth abdominal segment is a better character of separation, but even this breaks down in the case of the Lithodidæ, which were, indeed, placed by Latreille with the Crabs. Another criterion which is all but absolute is given by the fusion of the carapace at the side to the epistome. This is found in the Crabs, but only in the Scyllaridea and Eryonidea among the Macrura. No single difference, however, can be found which will absolutely and sharply define the Brachyura from the Macrura.

2. The next important step in the working out of the system was the establishment by H. Milne-Edwards in 1834 of a third suborder, the ANOMURA, intermediate between the two of Latreille. In the new group were placed certain of the higher Macrura (Paguridæ, Hippidæ, Porcellanidæ) and lower Brachyura (Dromiidæ, Homolidæ including *Lithodes*, Raninidæ), the abdomen in all these forms being more or less modified from the primitive macrurous condition, but keeping the sixth pair of limbs, except in the last two families. Milne-Edwards's Anomura has had a chequered history in the hands of various authorities, having been alternately added to or reduced, retained or parcelled out again between the Brachyura and Macrura. In a recent paper † I have tried to show that the macrurous members of the original suborder, with the addition of the Galatheinea and Thalassinidea, form a natural group, and must be retained as such in the classification.

3. The last important proposal for the modification of the classification of the Decapoda was made by Boas in 1880 ‡. On the basis of an examination of the anatomy of a number

* Gen. Crust. Insect. i. Fabricius's two classes Kleistagnatha and Exochnata of "Insects," and Lamarck's Cancri brachyuri and Cancri macrouri, had much the same extension.

† Gardiner's 'Fauna of the Maldives,' vol. ii. p. 690.

‡ Kongl. Danske Vidensk. Selsk. Skrifter, (6) i. p. 23.

of typical genera Boas came to the conclusion that the existing arrangement was unnatural in that it contrasted the Brachyura and Anomura—single branches of the Decapoda —with a heterogeneous assemblage (the Macrura) consisting of the whole of the rest of the tree, some branches of which are more nearly related to the Brachyura and Anomura than they are to the rest of the Macrura. He accordingly proposed to divide the order into two suborders—the REPTANTIA, containing the Crabs, Anomurous forms, Thalassinidea, Homaridea (Nephropsidea), Scyllaridea, and Eryonidea; and the NATANTIA, containing the Penæidea (including Stenopidæ) and the Caridea *. The names of these suborders indicate the main difference by which, on the whole, they are separated; a more accurate diagnosis will be found below.

4. There can be little question of the correctness of Boas's view that the members of his Reptantia form a natural group. The characters that they hold in common are too numerous and too specialized to admit of doubt on this point. But it by no means follows that the same is true of the Natantia. Unless it can be shown that the former group arose from the Decapod stem before the separation of the forms which constitute the latter, Boas's classification will be open to the objection that he raised against Latreille's—that is to say, it will be based, not on the divergence of two groups, but on the elevation of a branch to the same rank as the parent-stem. This, as it happens, is precisely the impression conveyed by the tree figured by Boas on p. 27 of his paper. The following considerations, however, serve to show that Boas's tree is wrong and his classification true.

A search for the most primitive group of the Decapoda leads, beyond all doubt, to the Penæidea. This is seen, (1) in their primitive life-history, recalling that of the Euphausiacea; (2) in the peculiar copulatory armature of the male, which suggests the same relationship; (3) in the small number of special features, unshared by other Decapoda, which the group possesses, and the number of characters that they have in common with one or other of the remaining groups—thus, with the lower Reptantia they share the shape of the first three pairs of legs, which are fairly alike except sometimes in size, and all chelate †, whereas those of the Caridea often differ much and their third pair is never chelate, the structure of the maxillipeds, which lack special modifications found in the Caridea, and the absence of the Caridean bend in the abdomen, while they share with the Caridea all those

* *Eukyphotes* of Boas.

† Except in the aberrant Sergestidæ.

characters, enumerated below, which separate the Natantia from the Reptantia; (4) in their early appearance in the earth's history (probably in the Trias), though it is true that the remains of Reptantia are found fully as early; (5) possibly in the structure of their gills, if, as Boas thinks, the phyllobranchiæ of the Caridea and the trichobranchiæ of the lower Reptantia be both derived from the dendrobranchiæ of the Penæidea. In any case it is impossible to regard the phyllobranch condition as the original one, but whether dendrobranchiæ or trichobranchiæ are to be regarded as the starting-point of the gills of the Decapoda is much more doubtful. It would be possible to support either theory by cases among the Euphausiacea which might be regarded as substantiating it.

The evidence for the primitive nature of the Penæidea is therefore strong, but it must not be supposed that the *modern* Penæids were the stock from which the rest of the order arose. Their loss of the *appendix interna* of the pleopods *, which is found in Euphausiacea and in many Reptantia and Caridea, is clear evidence that they do not stand in the direct line of descent of the latter two groups. Moreover, the original Decapoda must have borne the podobranch on the fourth leg found in some of the lower Reptantia and the epipodite on the last leg, of which Coutière has found a vestige in many Caridea. Both these structures have been lost by the Penæidea. The most that can be said is that, of modern Decapoda, the Penæidea more nearly approach the primitive condition than any others.

From the original Decapod stock, whose nearest descendants we have found in the modern Penæids, the Reptantia and Caridea must have arisen separately, for it is impossible to suppose that either of these specialized groups arose from the other. They have no characters in common which they do not also share with the Penæidea, and each, as we have seen, has characters which it shares with the latter group and not with the other. There remains, then, the question, which of the two was the first to leave the early Penæid stem, and that this was the Reptantia is shown pretty clearly by the following facts:—

(1) The Caridea and Penæidea have undoubtedly more in common with one another than either of them has with the Reptantia. This extends to characters which are at least not obviously primitive, such as the "stylocerite" of the first antenna.

(2) The gill-series in the lower Reptantia are fuller than in either Penæids or Carids, so that it seems likely

* Except on the second pair of the male.

that the stock from which the latter two groups have sprung lost a portion of their heritage in this respect after the differentiation of the former. For, not only have some of the lower Reptants kept the podobranchs on the legs of the fourth pair which all the Penæidea * and Caridea have lost, but on several segments in the Potamobiidæ we find the full possible branchial equipment. Coutière ('Comptes Rendus,' 1905, p. 64) has elaborated an extremely ingenious theory of the homologies of the several kinds of epipodial structures of the Decapoda with one another and with those of the lower Crustacea. Shortly put, this theory is as follows:—The primitive number of epipodial outgrowths of the thoracic limb of the Crustacea is two—a distal, the *epipodite,* belonging to the coxopodite, and a proximal, the *proepipodite*, belonging to the true basal joint of the limb, which in the Decapoda is taken into the body during development. Both these structures are found in *Branchipus* and in *Anaspides*. In Schizopoda and Decapoda both proepipodite and epipodite divide into two parts. The epipodite forms in the Lophogastridæ (a) the oostegite and (β) a setiferous tubercle which I shall call the *setobranch*. In the Caridea the epipodite forms, when present, (a) the "epipodite" (*mastigobranch*) and (β) on the legs a setobranch of the same form as in the Lophogastridæ, and on maxillipeds 2 and 3 a podobranch and an arthrobranch respectively; in the Penæidea it forms (a) the "epipodite" and (β) the (anterior) arthrobranch, wanting in Caridea and supposed to be there represented by the setobranch. The proepipodite forms in the Lophogastridæ a divided gill. In the Decapoda it forms (a) the pleurobranch and (b) the (posterior) arthrobranch. In the development of *Penæus* this subdivision can actually be seen to take place. The Euphausiacea have lost their proepipodite.

Now, valuable and suggestive as this theory is, it is to some extent invalidated by the fact that, in the case of section β of the epipodite, structures which it regards as alternative developments of the same rudiment can be found coexisting. For it supposes that one arthrobranch (presumably the anterior) and the podobranch and the setobranch are equivalent and alternative structures. But in the Potamobiidæ all these are present together on several segments of the body. In *Dromia* Bohn has discovered what is undoubtedly a setobranch on the third maxilliped, where, though the podobranch is wanting, both arthrobranchs are present. On the first leg the setobranch is found on the

* It is only in certain of the primitive deep-sea Penæids that the first two or three pairs of legs bear podobranchs.

base of the mastigobranch and appears as an outgrowth from it, suggesting strongly that the similar process on the mastigobranch of the third maxilliped of many crabs has the same origin and that the two branches of the forked "epipodite" of some Penæidæ represent the setobranch and mastigobranch respectively. Of course there are also cases in the lower Penæidæ and elsewhere where the podobranch and both arthrobranchs are found together. I would suggest, therefore, that in the primitive Decapoda the epipodite divided not into two but into four structures—(α) the mastigobranch, (β) the setobranch, (γ) the podobranch, (δ) the anterior arthrobranch—just as in the Lophogastridæ the proepipodite has sometimes as many as four branches. At the same time it must be remembered that the connexion of the anterior arthrobranch with the mastigobranch is not a proved fact, as is that of the posterior arthrobranch with the pleurobranch. It seems quite possible that the ancestors of the Decapoda bore not two but three rows of epipodial outgrowths on their limbs, and that the anterior arthrobranchs represent the middle of these three rows. Besides the "epipodite" and "proepipodite," *Branchipus* bears on the outer side of its thoracic limbs a third outgrowth of somewhat different form. This has been doubtfully claimed as the exopodite, but may quite possibly represent the mastigobranch.

(3) Whereas the Reptantia (Eryonidea &c.) appear in the Trias, the geological record shows no trace of Caridea till late Jurassic times. This group, in fact, is a late and somewhat specialized offshoot from the Penæid stem. The lower Reptantia have, perhaps, evolved further than the lower Caridea, but they are still in some respects more primitive and they took origin much earlier. Boas's arrangement is therefore justified. The Natantia are as natural a group as the Reptantia, and into these two suborders the order must be divided.

III.

In considering the subdivision of the Natantia it will be evident from what has been said that the Penæidea and the Caridea must stand as two tribes of the suborder. To these, however, must be added a third whose position needs some examination. The little family Stenopidæ was placed by Boas with the Penæidea, which it resembles in its three chelate legs and in other respects; but other authorities have very

* It is quite possible that the trichobranchiate nature of the gills of the lower Reptantia is another primitive feature lost by the Penæidea and Caridea.

rightly removed it to an independent division, the STENOPIDEA. The position of this group is extremely doubtful. It has clearly no relationship to the Caridea, for it differs from them and agrees with the Penæidea and lower Reptantia in all respects in which the Caridea are peculiar, but its penæid and reptant affinities are more evenly balanced. On the one hand, like most of the Penæidea it has lost all the podobranchs behind the second maxilliped and the *appendices internæ*, and has legs of the natant form ; on the other hand, like the lower Reptantia, it is trichobranchiate, has a curved mandibular palp and short endopodite to the first maxilliped, and lacks the copulatory apparatus of the male penæids and the spine (stylocerite) on the stalk of the antennule which is so characteristic of the Penæidea and Caridea.

There would be much to be said for placing this group by itself as a suborder, but, on the whole, its affinities with the Natantia seem strong enough to justify its being included with them.

Since the termination *-idea* is used below for groups of a lower rank, the names of the tribes of the Natantia have, in the key which follows, been made to end in *-ides*.

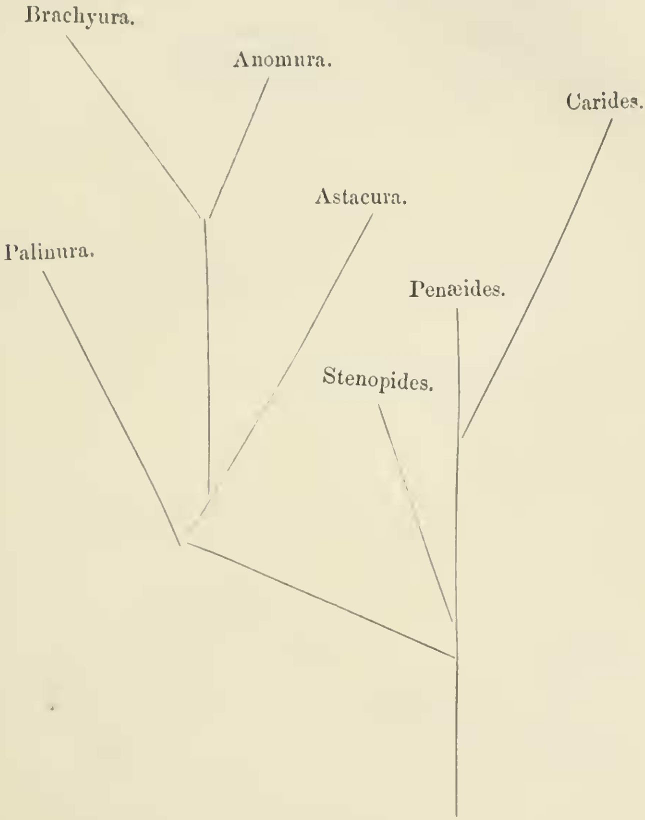
IV.

Within the Reptantia, the Brachyura and the Anomura stand out as natural groups. With these I have already dealt elsewhere *. There remain for consideration the Nephropsidea, Scyllaridea, and Eryonidea. The latter two of these divisions are closely related. They differ widely from the Nephropsidea in the fusion of the carapace to the epistome, the reduction of the rostrum † and of the inner lobes of the second maxillæ and first maxillipeds, the retention of *appendices internæ* on some of the limbs at least, and the lack of sharp sutures on the tail-fin, and are very ancient, whereas Nephropsidea, at least of the modern type, do not appear till somewhat later. I propose therefore to class the Scyllaridea and Eryonidea as a single tribe of the Reptantia, giving to this tribe the name PALINURA, which has the same ending as those of the other tribes of the suborder, and recalls the fact that the Palinuridæ are among its members and the position in which the abdomen is carried. For the sake of uniformity, the Nephropsidea may take the name ASTACURA, which will indicate that the tail-fin in all the members of the group is like that of *Astacus*, one of its most common representatives. Thus the old Macrura are completely dispersed.

* Gardiner's 'Fauna of the Maldives,' vol. ii. p. 690.
† Except in *Palinurellus*.

V.

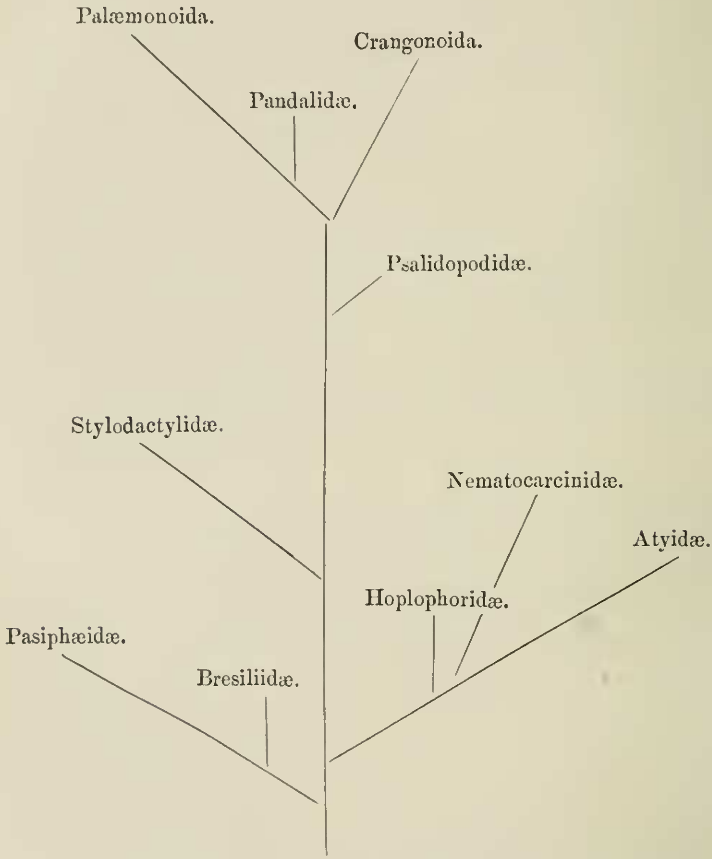
The following tree illustrates diagrammatically the relationship between the groups which have been discussed :—



VI.

I have grouped the families of the Carides into "super-families," based on, but not quite the same as, the extremely suggestive "alliances" proposed by Major Alcock for the Indian deep-sea families. The shape of the mandible should not be followed too implicitly as an indication of affinity in this group. It shows a tendency to division into "molar" and "cutting" halves throughout the order. In the higher Carides this division is greatly accentuated, but in some cases a secondary simplicity is reached by the loss of one of the halves, and this has happened independently in *Latreutes* and the Crangonoida (cutting-edge) and, I think, Pasiphæidæ (molar process). The palp comes and goes from genus to genus.

The following tree is an attempt to represent diagrammatically the course of the evolution of the Carides :—



VII.

In discussing the classification of the crabs, I have elsewhere * suggested, among other changes, the abolition of the distinction between the groups Cyclometopa and Catometopa. The families gathered under the latter name have probably genetic affinity, at least in some cases, but they pass into the

* Gardiner's 'Fauna of the Maldives,' vol. i. p. 425.

Cyclometopa by such easy transition and, even in typical genera, differ from them so little that their separation is a needless and misleading complication of the system. It would, in fact, be logically necessary, if a group Cyclometopa were to be retained, to balance it by dividing the other brachyrhynchous crabs into equivalent sections somewhat as follows:—(1) Corystidæ, (2) Portunidæ, (3) Potamonidæ, (4) Atelecyclidæ and Cancridæ, (5) Xanthidæ and Gonoplacidæ, (6) Pinnotheridæ, (7) ? Ptenoplacidæ and Palicidæ, (8) Hapalocarcinidæ.

VIII.

A Table of the Classification of the Crustacea Decapoda.

Suborder NATANTIA.

Tribe PENÆIDES.

Families: Penæidæ (subfamilies: Cerataspinæ, Aristæinæ, Sicyoninæ, Penæinæ), Sergestidæ (subfamilies: Sergestinæ, Amphioninæ, Leuciferinæ).

Tribe CARIDES.

Superfamily *Pasiphæoida.*
Families: Bresiliidæ, Pasiphæidæ.
Superfamily *Hoplophoroida.*
Families: Hoplophoridæ, Nematocarcinidæ, Atyidæ.
Superfamily *Stylodactyloida.*
Family Stylodactylidæ.
Superfamily *Psalidopodoida.*
Family Psalidopodidæ.
Superfamily *Pandaloida.*
Family Pandalidæ (subfamilies: Thalassocarinæ, Pandalinæ).
Superfamily *Palæmonoida.*
Families: Alpheidæ, Hippolytidæ, Rhynchocynetidæ, Palæmonidæ (subfamilies: Hymenocerinæ, Pontoniinæ, Palæmoninæ).
Superfamily *Crangonoida.*
Families: Gnathophyllidæ, [Autonomæidæ ?], Processidæ, Glyphocrangonidæ, Crangonidæ.

Tribe STENOPIDES.

Family Stenopidæ.

Suborder REPTANTIA.

Tribe PALINURA.

Superfamily *Eryonidea.*
Family Eryonidæ.
Superfamily *Scyllaridea.*
Families: Scyllaridæ, Palinuridæ.

Tribe ASTACURA.

Families: Nephropsidæ, Parastacidæ, Potamobiidæ.

Tribe Anomura.

Superfamily *Galatheidea.*

Families: Ægleidæ, Chirostylidæ, Galatheidæ (subfamilies: Galatheinæ, Munidopsinæ), Porcellanidæ.

Superfamily *Thalassinidea.*

Families: Axiidæ, Laomediidæ, Callianassidæ (subfamilies: Callianassinæ, Upogebiinæ), Thalassinidæ.

Superfamily *Paguridea.*

Families: Pylochelidæ, Paguridæ (subfamilies: Pagurinæ, Eupagurinæ), Cœnobitidæ, Lithodidæ (subfamilies: Hapalogastrinæ, Lithodinæ).

Superfamily *Hippidea.*

Families: Albuneidæ, Hippidæ.

Tribe Brachyura.

Subtribe Dromiacea.

Superfamily *Dromiidea.*

Families: Homolodromiidæ, Dromiidæ, Dynomeriidæ.

Superfamily *Homolidea.*

Families: Homolidæ, Latreillidæ.

Subtribe Brachygnatha.

Superfamily *Brachyrhyncha* (*Cancridea*).

Families: Corystidæ, Atelecyclidæ (subfamilies: Thiinæ, Acanthocyclinæ, Atelecyclinæ), ? Trichiidæ, Cancridæ (subfamilies: Cancrinæ, Pirimelinæ), Portunidæ (subfamilies: Carcinidinæ, Portumninæ, Catoptrinæ, Carupinæ, Portuninæ, Caphyrinæ, Thalamitinæ, Podophthalminæ), Potamonidæ (subfamilies: Potamoninæ, Deckeniinæ, Potamocarcininæ, Trichodactylinæ), Xanthidæ (subfamilies: Xanthinæ, Carpilinæ, Etisinæ, Menippinæ, Trapeziinæ, Eriphiinæ, Oziinæ), Carcinoplacidæ (subfamilies: Carcinoplacinæ, Gonoplacinæ, Prionoplacinæ, Rhizopinæ, Hexapodinæ), Pinnotheridæ, Grapsidæ (subfamilies: Grapsinæ, Varuninæ, Sesarminæ, Plagusiinæ), Gecarcinidæ, Ocypodidæ (subfamilies: Ocypodinæ, Macrophthalminæ, Mictyrinæ), Palicidæ, Ptenoplacidæ, Hapalocarcinidæ.

Superfamily *Oxyrhyncha* (*Maiidea*).

Families: Parthenopidæ (subfamilies: Parthenopinæ, Eumedoninæ), Maiidæ (subfamilies: Inachinæ, Acanthonychinæ, Pirinæ, Maiinæ), Hymenosomidæ.

Subtribe Oxystomata.

Families: Calappidæ (subfamilies: Calappinæ, Orithyinæ, Matutinæ), Leucosiidæ (subfamilies: Leucosiinæ, Iliinæ), Raninidæ, Dorippidæ (subfamilies: Dorippinæ, Tymolinæ).

IX.

A Conspectus of the Classification of the Crustacea Decapoda.

Key to the Suborders.

I. Rostrum seldom reduced or absent, if well developed almost invariably compressed. Body almost always compressed. First abdominal segment not much smaller than the rest. First antennæ generally bear a stylocerite. Second antennal scale generally large. Legs slender (except sometimes a stout chelate limb or pair which may be any one of the first three pairs), with basipodite and ischiopodite never fused, only one fixed point in the carpo-propodal articulation, sometimes exopodites, and podobranchs hardly ever present on the first three pairs and never on the last two. Male genital opening almost always arthrodial. Abdominal limbs 1–5 always present in full number, well developed, and used for swimming. **NATANTIA.**

II. Rostrum often reduced or absent, depressed if present. Body not compressed, generally depressed. First abdominal segment distinctly smaller than the rest. No stylocerite. Second antennal scale never large, generally small or absent. Legs strong, the first usually, the others never, stouter than their fellows, basipodite and ischiopodite almost always fused in the first pair, generally also in the others; two fixed points in the carpo-propodal articulation, exopodites never present, podobranchs fairly often present on some of the first four pairs. Male genital opening coxal or sternal. Abdominal limbs 1–5 often reduced or absent, not used for swimming .... **REPTANTIA.**

Key to the Tribes of the Natantia.

I. Third legs chelate, except in genera in which the legs are much reduced. Third maxillipeds 7-jointed. Second maxillipeds with normal end-joints. First maxillipeds without the caridean lobe on the base of the exopodites. Pleura of first abdominal segment not overlapped by those of second. Abdomen without sharp bend. Not phyllobranchiate (except Amphioninæ).

1. One or both legs of third pair longer and much stouter than those of first two pairs. Trichobranchiate. Endopodites of first maxillipeds short. Mandibular palps curved. First antennæ without stylocerites. First abdominal limbs of male not as in Penæides .... *STENOPIDES.*
2. Legs of third pair not stouter than those of first two pairs. Dendrobranchiate (except Leuciferinæ and Amphioninæ: see below). Endopodites of first maxillipeds long. Mandibular palps straight. First antennæ generally with stylocerites. First abdominal limbs of male bear a sexual apparatus .... *PENÆIDES.*

II. Third legs not chelate. Third maxillipeds 4–6-jointed. End-joint in second maxillipeds nearly always lies as a strip along end of joint before it. First maxillipeds have a lobe on the base of the exopodites. Pleura of second abdominal segment overlap those of first. Abdomen has generally a sharp bend. Phyllobranchiate .... *CARIDES.*

Key to the Families of the Penæides.

I. Last two pairs of legs well developed. Gills many .... **Penæidæ.**
II. Last one or two pairs of legs reduced or lost. Gills few (up to 8) or wanting .... **Sergestidæ.**

Key to the Subfamilies of the Penæidæ.

I. Carapace covers legs. Exopodites well developed. [Podobranchs on some legs.]...... *Cerataspinæ.*
II. Carapace of normal size. Exopodites reduced or lost.
  1. Well-developed podobranchs on some legs. [Exopodites on maxillipeds and sometimes on some legs. Arthrobranchs in double series. First antennæ without leaf-like appendage on first joint.] .... *Aristæinæ.*
  2. No podobranchs on legs (vestige on first legs of *Haliporus*).
    i. No exopodite behind first maxillipeds. Arthrobranchs in single series. No leaf-like appendage on first joint in first antennæ .... *Sicyoninæ.*
    ii. Exopodites on all maxillipeds and usually some legs. Arthrobranchs in double series. A leaf-like appendage on inner side of first joint in first antennæ .... *Penæinæ.*

Key to the Subfamilies of the Sergestidæ.

I. All the thoracic limbs biramous. Gills present and resemble phyllobranchiæ...... *Amphioninæ.*
II. Last seven thoracic limbs uniramous. Gills, if present, are dendrobranchiæ.
  1. Head not greatly elongated. Gills present. *Sergestinæ.*
  2. Head greatly elongated. No gills ...... *Leuciferinæ.*

Key to the Superfamilies of the Carides.

I. Second maxillipeds normal. [Exopodites on some or all legs. Mastigobranchs on none. First two pairs stouter than the rest, with normal chelæ and undivided wrist-joints. Mandibles without or with distinct but small molar process, with or without palps.] .... PASIPHÆOIDA.

II. Second maxillipeds with the sixth and seventh joints articulating separately on fifth. [No exopodites on legs. Mastigobranchs on first to fourth pairs. First two pairs of good size, chelate, with very long fingers and undivided wrist-joints. Mandibles imperfectly cleft, with palp.]	STYLODACTYLOIDA.
III. Second maxillipeds with short seventh joint, usually applied as a strip to the end of the sixth.	
1. Mandibles imperfectly cleft. Exopodites usually present on all or some legs. First two pairs of legs substantially similar, of moderate size, chelate, with undivided wrist-joint. [Mastigobranchs present on some legs (except *Limnocaridina*).]	HOPLOPHOROIDA.
2. Mandibles either deeply cleft or simple, apparently owing to the loss of the cutting-edge. No exopodites on legs (except in a very few cases on the first pair). First two pairs of legs more or less unlike.	
i. At least the basipodites of the second maxillæ well developed. Mandibles rarely simple (*Latreutes* &c.). First legs not subchelate.	
(1) First two pairs of legs slender. First pair simple or minutely chelate. Second chelate, with wrist divided into two or more joints. [Mastigobranchs generally present on legs.] . .	PANDALOIDA.
(2) First legs with both fingers movable, second with last joint replaced by a tuft of bristles and undivided wrist-joint. [No mastigobranchs on legs.]	PSALIDOPODOIDA.
(3) First two pairs of legs not both slender (one often very large), chelate. Wrist of second pair often subdivided. [Mastigobranchs present or not.] . .	PALÆMONOIDA.
ii. Inner lobes of second maxillæ reduced. Mandibles simple. First legs often subchelate. [Second wrist divided or not. No mastigobranchs on legs.]	CRANGONOIDA.

Key to the Families of the Pasiphæoida.

I. Rostrum small or wanting. No molar process on the mandibles. Inner lobes of second maxillæ and first maxillipeds reduced. Exopodites on all legs	**Pasiphæidæ.**
II. Rostrum well developed. Mandibles with a distinct molar process. Inner lobes of second maxillæ and first maxillipeds not reduced. Exopodites on first two pairs of legs only . .	**Bresiliidæ.**

Key to the Families of the Hoplophoroida.

I. Both fingers of chelæ spoon-like and ending in tufts of bristles. Exopodites may be

wanting on some or all legs. Freshwater forms .... **Atyidæ.**
II. Chelæ not as in Atyidæ. Exopodites on all legs. Deep-sea forms.
1. Last three pairs of legs abnormally long. A lash on the exopodite of the first maxillipeds.......................... **Nematocarcinidæ.**
2. Last three pairs of legs not abnormally long. No lash on the exopodite of the first maxillipeds .... **Hoplophoridæ.**

Key to the Subfamilies of the Pandalidæ.

I. Second wrists undivided .... *Thalassocarinæ.*
II. Second wrists subdivided .... *Pandalinæ.*

Key to the Families of the Palæmonoida.

I. Second wrists subdivided.
1. First legs much stronger than rest. Eyes usually covered by carapace. [Mastigobranchs of legs and mandibular palps present.] .... **Alpheidæ.**
2. First legs not much stronger than rest. Eyes not covered by carapace. [Mastigobranchs of legs and mandibular palps present or absent.] .... **Hippolytidæ.**
II. Second wrists undivided.
1. Rostrum movable. Mastigobranchs on legs. [Mandibular palp present.] ...... **Rhynchocinetidæ.**
2. Rostrum not movable. No mastigobranchs on legs .... **Palæmonidæ.**

Key to the Subfamilies of the Palæmonidæ.

I. First antennæ with two flagella (one usually cleft for some distance from the tip). Third maxillipeds have third joint flat and often broad.
1. Mandibles with palps. Propodites of second legs, third maxillipeds, and one branch in first antennæ broad and flat .. *Hymenocerinæ.*
2. Mandibles without palps. Limbs not broadened as in Hymenocerinæ .... *Pontoniinæ.*
II. First antennæ with three flagella (owing to cleavage of one almost or quite to the base). Third maxillipeds pediform. [Mandibular palps usually present.] .... *Palæmoninæ.*

Key to the Families of the Crangonoida.

I. One or both legs of first pair chelate. Rostrum short, compressed.
[1. Second legs simple .... **Autonomæidæ.**] *

* The only ground for placing here the very obscure genus *Autonomæa* is that Risso, who described it, thought it related to *Processa.*

2. Second legs chelate.
   i. Both legs of the first pair chelate. Second wrists undivided. Third joint in the third maxillipeds very broad. Rostrum toothed .... **Gnathophyllidæ.**
   ii. One leg of the first pair simple. Second wrists subdivided. Third maxillipeds pediform. Rostrum not toothed .... **Processidæ.**

II. Both legs of the first pair subchelate. Rostrum long or short, not compressed.
   1. Second wrists subdivided. Inner lobes of first maxillipeds not reduced. Rostrum long .... **Glyphocrangonidæ.**
   2. Second wrist undivided. Inner lobes of first maxillipeds reduced. Rostrum short. **Crangonidæ.**

Key to the Tribes of the Reptantia.

I. Third legs like first, either chelate or simple and subcylindrical. Abdomen macrurous (straight, symmetrical, well armoured, with good pleura and strong broad tail-fin, lobes on the first segment clipping the carapace). Gnathobases of second maxillæ narrow. Basipoditic lobes of first maxillipeds usually deep. Exopodites of maxillipeds with lash directed forwards. Gills numerous. [Last thoracic segment with legs not differing greatly from the rest and sternum rarely free.]
   1. Carapace fused at the sides to the epistome. Rostrum small or wanting (except *Palinurellus*). Inner lobes of second maxillæ and first maxillipeds reduced. An *appendix interna* on some of the abdominal limbs, at least in the female, but the exopodites of the last pair without sharp suture. Body often depressed.......... *PALINURA.*
   2. Carapace free from the epistome. Rostrum of good size. Inner lobes of second maxillæ and first maxillipeds not reduced. No *appendix interna*, but the exopodites of the last abdominal limb divided by a suture. Body subcylindrical .... *ASTACURA.*

II. Third legs unlike first *, never chelate. Abdomen rarely macrurous. Gnathobase of second maxillæ typically broad. Basipoditic lobes of first maxillipeds broad but shallow, their inner edge usually in a line with that of the coxopodite. Exopodites of maxillipeds with lash, when present, nearly always bent inwards. Gills usually few.
   1. Carapace not fused with epistome. Last thoracic sternum free, its legs differing

* *Gebicula* nearly forms an exception to this.

always clearly in size and position and nearly always in size and shape from the third pair. Abdomen anomurous (reduced in some of its features, but showing clear traces of some function other than that of reproduction, and almost always carrying biramous limbs on the sixth segment) or, rarely, macrurous. A movable antennal scale often present. Third maxillipeds usually narrow .... *ANOMURA.*

2. Carapace fused with epistome at sides and nearly always also in middle. Last thoracic sternum fused with rest, its legs often like the others. Abdomen brachyurous (small, straight, symmetrical, bent under the thorax, showing no traces of other function than reproduction, and without biramous limbs on the sixth segment). Never a movable antennal scale. Third maxillipeds broad .... *BRACHYURA.*

Key to the Superfamilies of the Palinura.

I. Carapace gripped by the first abdominal segment alone. First joint of second antennæ not fused with epistome; a scale present on this limb. All the legs, except sometimes the last pair, chelate; the first larger than the rest. Unbranched limbs on the first abdominal segment. Tail-fin not softer behind than before, without sutures. Telson pointed .... Eryonidea.

II. Carapace gripped between a lobe on the first abdominal segment and a knob on the side of the last thoracic. First joint of second antennæ fused with epistome; no scale on this limb. None of the legs much longer than the rest, or, except sometimes the first pair, chelate. No limbs on first abdominal segment. Tail-fin divided by indistinct sutures into a soft hinder half and a harder front half. Telson roughly square behind. . Scyllaridea.

Key to the Families of the Scyllaridea.

I. Cephalothorax subcylindrical. Eyes not enclosed in separate orbits formed by the edge of the carapace. Second antennæ with flagella .... **Palinuridæ.**

II. Cephalothorax depressed. Eyes enclosed in separate orbits formed by the edge of the carapace. Second antennæ with flat scales in place of the flagella .... **Scyllaridæ.**

Key to the Families of the Astacura.

I. Podobranchs not united with the mastigobranchs. Last thoracic segment fixed. [Sexual appendages in male. Four pleurobranchs.] .... **Nephropsidæ.**

II. Podobranchs united with the mastigobranchs. Last thoracic segment free.

1. Gills have a lamina, but no hooks at the end of the filaments. Sexual appendages in male. One pleurobranch or none .... **Potamobiidæ.**
2. Gills have no lamina, but hooks at the end of the filaments. No sexual appendages in male. Generally four pleurobranchs.. **Parastacidæ.**

Key to the Superfamilies of the Anomura.

I. Second to fourth legs with last joint curved and flattened. First pair styliform or subchelate. [Tail-fin not adapted for swimming. Abdomen bent under thorax. Rostrum small or wanting. Third maxillipeds have no mastigobranchs.] .... HIPPIDEA.

II. Second to fourth legs with last joint not curved and flattened. First pair not styliform, rarely subchelate.

1. Sixth abdominal limbs adapted for swimming (except in *Thalassina*, where they are styliform). Pleura usually well developed. Abdomen symmetrical.
   - i. Body depressed. Pleurobranchs to last legs. Often a transverse suture on telson. Abdomen more or less bent .. GALATHEIDEA.
   - ii. Body compressed. No pleurobranch to last leg. No transverse suture on telson. Abdomen straight.................. THALASSINIDEA.
2. Sixth abdominal limbs, when present, with branches neither broad nor styliform, but adapted for holding the body into hollow objects. Pleura very rare. Abdomen nearly always asymmetrical, and either soft and twisted or bent under the thorax. PAGURIDEA.

Key to the Families of the Hippidea.

I. First legs subchelate. Carapace flattened, without wings to cover the legs. Third maxillipeds narrow, with exopodites ...... **Albuneidæ.**

II. First legs simple. Carapace subcylindrical, with wings which cover the legs. Third maxillipeds broad, without exopodites .... **Hippidæ.**

Key to the Families of the Galatheidea.

I. Trichobranchiate. Eight arthrobranchs. No limbs on second abdominal segment of male. [Abdomen not folded against thorax. Second antennæ with 5-jointed stalk, but no scale.] **Ægleidæ.**

II. Phyllobranchiate. Ten arthrobranchs. Limbs on second abdominal segment of male.
  1. Arthrobranchs stand on side of thorax. Second antennæ have 5-jointed stalk and usually a spiniform scale. [Abdomen not folded against the thorax. Third maxillipeds without mastigobranch.] .... **Chirostylidæ.**
  2. Arthrobranchs normally placed. Second antennæ have 4-jointed stalk and no scale (or vestiges only).
    i. Abdomen not folded against thorax. Third maxillipeds with mastigobranchs...... **Galatheidæ.**
    ii. Abdomen folded against thorax. Body crab-like. Third maxillipeds without mastigobranchs .... **Porcellanidæ.**

Key to the Subfamilies of the Galatheidæ.

I. Eyes well developed. Exopodites of third maxillipeds with 1-jointed "flagella" .... *Galatheinæ.*
II. Eyes reduced. Exopodites of third maxillipeds without flagella ... . *Munidopsinæ.*

Key to the Families of the Thalassinidea.

I. No *linea thalassinica*. Both movable and fixed antennal thorns present, though sometimes minute (? absent in *Scytoleptus*). Abdominal pleura large. [Last endopodite without suture. Second legs chelate.] .... **Axiidæ.**
II. *Linea thalassinica* present (except *Callianidea*). Fixed antennal thorn wanting; scale reduced to a flattened vestige or wanting. Abdominal pleura usually small.
  1. Sutures on endopodite and exopodite of sixth abdominal limbs. Abdominal pleura of a good size........................ **Laomediidæ.**
  2. No sutures on sixth abdominal limbs. Abdominal pleura small.
    i. Second leg chelate or simple. No podobranchs on legs. Abdominal limbs 3–6 broad. A vestige of antennal scale remains .... **Callianassidæ**
    ii. Second leg subchelate. Podobranchs on legs 1–3. Abdominal limbs all narrow. No vestige of antennal scale.......... **Thalassinidæ.**

Key to the Subfamilies of the Callianassidæ.

I. Rostrum large. Legs of first pair equal. No *appendix interna* on abdominal limbs 3–5 . . *Upogebiinæ.*
II. Rostrum small. Legs of first pair unequal. An *appendix interna* on abdominal limbs 3–5. *Callianassinæ.*

Key to the Families of the Paguridea.

I. Abdomen straight or twisted. Carapace firm and more or less compressed in the fore part, soft in the hinder part, at least at the sides. Fourth legs unlike third. Rostrum almost or quite wanting. Sixth abdominal limb present.
  1. Abdomen macrurous and symmetrical, with all the limbs present. Trichobranchiate. **Pylochelidæ.**
  2. Abdomen more or less unsymmetrical, some of the limbs lost. Generally phyllobranchiate.
    i. Antennal scale well developed (thornlike). First antennæ with stalk of moderate length and flagella ending in a filament. Marine forms .... **Paguridæ.**
    ii. Antennal scale reduced. First antennæ with very long stalk and flagella ending bluntly. Land forms .... **Cœnobitidæ.**

II. Abdomen bent under thorax. Body crablike. Carapace firm all over. Fourth legs like third. Rostrum spiniform. Sixth abdominal appendages lost .... **Lithodidæ.**

Key to the Subfamilies of the Paguridæ.

I. Third maxillipeds approximated at base. Chelipeds equal or subequal, or the left much the larger .... *Pagurinæ.*

II. Third maxillipeds wide apart at base. Right cheliped usually, left never, much the larger. *Eupagurinæ.*

Key to the Subfamilies of the Lithodidæ.

I. Third to fifth abdominal segments imperfectly calcified. Rostrum short and broad ...... *Hapalogastrinæ.*

II. Third to fifth abdominal segments well calcified. Rostrum generally narrow and pointed. *Lithodinæ.*

Key to the Subtribes of the Brachyura.

I. Mouth-field (endostome) prolonged forwards to form a gutter. [Last pair of legs normal or abnormal. Female openings generally sternal. First abdominal limbs of female wanting. Gills few.] .... OXYSTOMATA.

II. Mouth-field roughly square.
  A. Last pair of legs abnormal, dorsal. Female openings coxal. First abdominal limbs of female present. Gills usually many .... DROMIACEA.
  B. Last pair of legs normal, rarely reduced, not dorsal, except in *Palicus* and *Ptenoplax*. Female openings sternal. First abdominal limbs of female wanting. Gills few .... BRACHYGNATHA.

Key to the Families of the Oxystomata.

I. Body of the shape usual in crabs. Abdomen hidden under thorax. Antennæ small. Legs normal in position.
  A. Afferent openings to gill-chambers lie in front of first legs (chelipeds). Gills 9 on each side. Male openings coxal .... **Calappidæ.**
  B. Afferent openings to gill-chambers lie on either side of the mouth at the base of the third maxillipeds. Gills less than 9 a side. Male openings sternal .... **Leucosiidæ.**

II. Body more or less abnormal in shape. Abdomen not hidden under thorax. Antennæ large. Last one or two pairs of legs in a more dorsal position than the rest.
  A. Carapace short. Last two pairs of legs subprehensile, with hook-like end-joints. . **Dorippidæ.**
  B. Carapace long. Legs usually have the last two joints very broad .... **Raninidæ.**

Key to the Subfamilies of the Calappidæ.

I. Last three joints in third maxillipeds not hidden by the meropodite. Orbits not separated from the antennular sockets.
  A. Meropodites of third maxillipeds not elongate nor acute. Exopodites of same limbs with flagella. Legs not adapted for swimming .... *Calappinæ.*
  B. Meropodites of third maxillipeds elongate and acute. Exopodites of same limbs without flagella. Legs adapted for swimming .... *Orithyinæ.*

II. Last three joints in third maxillipeds hidden by the meropodite. Orbits more or less separated from the antennular sockets. [Exopodites of third maxillipeds with flagella. Meropodite in same limbs elongate and acute. Legs may be adapted for swimming or not.] .... *Matutinæ.*

Key to the Subfamilies of the Leucosiidæ.

I. Meropodites of third maxillipeds more than half the length of the ischiopodites. Fingers stout, gradually narrowing from base to tip, usually shorter than the palm .... *Leucosiinæ.*

II. Meropodites of third maxillipeds never more than half the length of the ischiopodites. Fingers slender, of even width from the base to near the tip, usually longer than palm . . *Iliinæ.*

Key to the Subfamilies of the Dorippidæ.

I. Third maxillipeds leave a good part of the mouth uncovered. Inward openings to the gills near the base of the chelipeds........ *Dorippinæ.*

II. Third maxillipeds almost completely cover the mouth. Inward openings to the gills may or may not be near the base of the chelipeds .... *Tymolinæ.*

Key to the Superfamilies of the Dromiacea.

I. Sternum of female with longitudinal grooves. Vestiges of sixth abdominal limbs usually present. Gills 14–20 on each side. Eyes usually completely sheltered by orbits when retracted. No *lineæ homolicæ* .... DROMIIDEA.

II. Sternum of female without longitudinal grooves. No vestiges of sixth abdominal limbs. Gills 8–14 on each side. Eyes incompletely or not at all sheltered by orbits when withdrawn against the body. *Lineæ homolicæ* usually present .... HOMOLIDEA.

Key to the Families of the Dromiidea.

I. No vestige of sixth abdominal limbs. Carapace longer than broad, with ill-marked side-edge. [First three legs with mastigobranchs, fourth and fifth small, subdorsal, and prehensile.] .... **Homolodromiidæ.**

II. Vestiges of sixth abdominal limbs present (except in *Hypoconcha*, where also no mastigobranchs). Carapace usually not longer than broad, with well-marked side-edge.

A. Mastigobranchs on first legs (chelipeds) only or on none. Fourth and fifth legs small, subdorsal, and usually prehensile. . **Dromiidæ.**

B. Mastigobranchs on all the first three pairs of legs. Fifth legs only small and subdorsal .... **Dynomenidæ.**

Key to the Families of the Homolidea.

I. Gills 13 or 14 on each side. Mastigobranchs on first one or three pairs of legs. First joint of eye-stalks not much longer than second . **Homolidæ.**

II. Gills 8 on each side. Mastigobranchs not found on any legs. First joint of eye-stalks much longer than second................ **Latreillidæ.**

Key to the Superfamilies of the Brachygnatha.

I. Fore part of body narrow, usually forming a distinct rostrum. Body more or less triangular. Orbits generally incomplete ...... OXYRHYNCHA [(MAIIDEA).

II. Fore part of body broad. Rostrum usually reduced or wanting. Body oval, round, or square. Orbits nearly always well enclosed. BRACHYRHYNCHA [(CANCRIDEA).

Key to the Families of the Oxyrhyncha.

I. Carapace thin and flat. First legs (chelipeds) not long or specially mobile or with fingers bent at an angle with the hand. Male opening sternal. [No orbits. Second joint of antennal stalk slender, fused with epistome but not with front. No hooked hairs.] . . . . **Hymenosomidæ.**

II. Carapace not thin and flat (except *Ocinopus*). First legs either mobile or powerful, with bent fingers. Male opening coxal.

  A. Chelipeds specially mobile, rarely much greater than the other legs, or with fingers bent at an angle on the hand. Second joint of antenna well developed, generally fused with epistome and often with front. Orbits generally more or less incomplete. Hooked hairs almost always present . . . . **Maiidæ.**

  B. Chelipeds not specially mobile, usually much longer and heavier than the other legs, and with fingers bent on the hand at an angle towards the side on which the fixed finger is set. Second joint of antennæ small, short, and not fused with epistome or front. Orbits well made. Hooked hairs almost always wanting . . **Parthenopidæ.**

Key to the Subfamilies of the Maiidæ.

I. Second joint of antennæ very slender throughout its length. [No orbits. Eye-stalks generally long.] . . . . *Inachinæ.*

II. Second joint of antennæ not very slender.

  A. No true orbits (eye-stalks hidden under a supraocular spine or sunken in the sides of a great rostrum). Second joint of antenna truncate-triangular. Eye-stalks very short . . . . *Acanthonychinæ.*

  B. True orbits, containing both supra- and postocular elements sheltering the eyes, are more or less completely formed, except in a few genera where the eye-stalks are long and slender. Second antenna-joint broad, usually not truncate-triangular. Eye-stalks long or short.

    1. A large, cupped, usually blunt postocular process present. Eye-stalks short. Cornea of eyes not completely hidden when they are folded back . . . . *Pisinæ.*

    2. Postocular process, if present, usually sharp and not cupped, but if not so, then cornea hidden (as also in most other cases). Eye-stalks usually long . *Maiinæ.*

Key to the Subfamilies of the Parthenopidæ.

I. Carapace usually triangular, sometimes suboval or subpentagonal. Rostrum simple.

Chelipeds much bigger than the other legs. Branchial regions of the body deeply separated from cardiac . . . . *Parthenopinæ.*

II. Carapace usually sharply pentagonal. Rostrum cleft into two. Chelipeds of moderate size. Branchial regions of the body not deeply separated from cardiac . . . . *Eumedoninæ.*

Key to the Families of the Brachyrhyncha.

I. Orbits formed, but more or less incomplete. Second antennal flagella, when present, long and hairy. Rostrum present. Body elongate-oval. Fore edge of the mouth indistinct . . . . **Corystidæ.**

II. Orbits complete (though fissures may remain), except in the Mictyrinæ, where the eyes are almost or quite unprotected. Body rarely elongate-oval. Rostrum often wanting. Second antennal flagella usually short, not hairy.

A. Carpopodites of third maxillipeds articulate at or near antero-internal angle of the meropodites. Body usually round or transversely oval. Male openings nearly always coxal. In many species the right chela is always larger than the left.

1. Legs more or less distinctly adapted for swimming. Usually a small lobe on the inner angle of the endopodite in the first maxillipeds. [First antennæ fold slanting or transverse.] . . . . **Portunidæ.**

2. Legs not adapted for swimming, or, if so modified, then the vas deferens opens sternally or runs in a sternal groove (certain *Macrophthalmus* and *Libystes*). Inner lobe on the endopodite in the first maxillipeds wanting.

a. Freshwater crabs with the branchial region much developed and swollen. [Body often squarish, but male opening coxal.] . . . . **Potamonidæ.**

b. Marine crabs, with the branchial region not greatly swollen.

i. First antennæ fold lengthwise.

(*a*) Carapace subcircular. Second antennal flagella either long and hairy or wanting . . . . **Atelecyclidæ *.**

(*b*) Carapace broadly oval or hexagonal. Second antennal flagella present, short, not hairy . . . . . . **Cancridæ.**

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* *Trichia*, de Haan, is somewhere in the neighbourhood of this family.

ii. First antennæ fold slanting or transversely.
(*a*) Body usually transversely oval. Male openings rarely sternal. Not sharply separated from the following family .... **Xanthidæ.**
(*b*) Body usually square or squarish. Male ducts open on the sternum, or, if coxal, pass along a groove in the sternum. Not sharply separated from the foregoing family .... **Gonoplacidæ.**

B. Carpopodites of third maxillipeds do not articulate at or near the inner angle of the meropodites. Body usually square or squarish. Male openings sternal, except in *Ptenoplax*, where the duct passes along a sternal groove to the coxopodite. In no species is the right chela always larger than the left.
1. Small symbiotic crabs, with very small eyes and orbits. Body usually more or less rounded .... **Pinnotheridæ.**
2. Free-living crabs, with eyes not specially reduced and usually a square body.
a. Last pair of legs dorsally placed and weaker than the others. Interantennular septum very thin. [No distinct epistome. Exopodites of third maxillipeds not hidden.]
i. Front narrow. Female opening in normal position. Third maxillipeds subpediform, not covering the mouth........................ **Ptenoplacidæ.**
ii. Front moderately broad. Female openings on the sternal segment corresponding to first pair of walking-legs. Third maxillipeds cover the mouth ventrally and have very small meropodites............. **Palicidæ.**
b. Last pair of legs not dorsally placed nor markedly weaker than the rest. Interantennular septum not very thin, except in Macrophthalminæ.
i. A gap of greater or less size is left between the third maxillipeds. Front broad or moderately so.
(*a*) Sides of the body either straight or very slightly arched. Shape square. Rarely true land-crabs. **Grapsidæ.**
(*b*) Sides of the body arched. Shape transversely oval. Land-crabs . **Gecarcinidæ.**
ii. Third maxillipeds almost or quite close the mouth. Front moderately or very narrow .... **Ocypodidæ.**

C. Meropodite in third maxillipeds small, bearing terminally a carpopodite of nearly its own width. Ischiopodite very broad. [Body somewhat oblong. First antennæ not retractile into sockets. Parasitic on corals.] .... **Hapalocarcinidæ.**

Key to the Subfamilies of the Portunidæ.

I. Eye-stalk and orbits normal.
  A. Basal joint of second antennæ narrow. [Flagella of second antennæ not shut out from orbits.]
    i. First antennæ sloping. Front with a median tooth. Generally at least one pair of walking-legs as long as chelipeds.
      1. Last pair of legs not distinctly natatorial. *Carcinidinæ.*
      2. Last pair of legs distinctly natatorial . *Portumninæ.*
    ii. First antennæ transverse. Front with a median notch. Chelipeds longer than walking-legs.
      1. Last joint of fifth legs lanceolate .... *Catoptrinæ.*
      2. Last joint of fifth legs rounded ...... *Carupinæ.*
  B. Basal joint of second antennæ broad. [Chelipeds longer than walking-legs.]
    i. Flagella of second antennæ not shut out from orbits by processes of the basal joints .... *Portuninæ.*
    ii. Flagella of second antennæ shut out from the orbit by processes of the basal joints.
      1. Last joint of fifth legs sickle-shaped .. *Caphyrinæ.*
      2. Last joint of fifth legs flattened ...... *Thalamitinæ.*
II. Eye-stalks enormously long, orbits extend across the whole fore edge of the carapace. [Chelipeds longer than legs. Antennæ free; basal joint short; flagella not shut out from orbits.] .... *Podophthalminæ.*

Key to the Subfamilies of the Potamonidæ.

I. Outward channels from gill-chamber covered by first maxillipeds, reaching to front. [Third maxillipeds with meropodites not longer than broad, subtriangular, bearing carpopodites at apex, with good exopodites.] *Deckeniinæ.*
II. Outward channels from gill-chamber not as in Deckeniinæ.
  1. Endostome ridges project on fore edge of mouth. Exopodites of third maxillipeds more or less reduced. [Meropodites of same subtriangular, not longer than broad, with carpopodites at apex.] .... *Potamocarcininæ.*
  2. Endostome ridges do not project on fore edge of mouth. Exopodites of third maxillipeds not reduced.
    i. Meropodites of third maxillipeds not longer than broad, subquadrate, with carpopodites at inner angles .... *Potamoninæ.*

ii. Meropodites of third maxillipeds longer than broad, bearing carpopodites on fore edge, which slopes inwards .... *Trichodactylinæ.*

Key to the Subfamilies of the Atelecyclidæ.

I. Antennal flagella absent. [Mouth covered by third maxillipeds. Front uncleft.] .... *Acanthocyclinæ.*
II. Antennal flagella present.
  A. Regions not defined. Third maxillipeds cover the mouth. Front entire or lobed . *Thiinæ.*
  B. Regions more or less clearly marked out. Third maxillipeds do not cover the mouth. Front toothed .... *Atelecyclinæ.*

Key to the Subfamilies of the Cancridæ.

I. Carapace broadly oval. Epistome not sunken. *Cancrinæ.*
II. Carapace hexagonal. Epistome sunken .... *Pirimelinæ.*

Key to the Subfamilies of the Xanthidæ.

I. Endostome ridges wanting. Shape of body transversely oval or round.
  1. Flagella of second antennæ not shut out of orbital gaps.
    i. Second joint of second antennal stalk cylindrical, reaching front but not entering orbital gap .... *Xanthinæ.*
    ii. Second joint of second antennal stalk as in Xanthinæ, but not entering orbital gap .... *Carpilinæ.*
  2. Flagella of second antennæ shut out of orbital gaps by part of second joints of stalks .... *Etisinæ.*
II. Endostome ridges present. Shape of body often square or squarish.
  1. Front less than $\frac{1}{2}$ and fronto-orbital edge (front and orbits together) not more than $\frac{2}{3}$ the greatest breadth of the carapace. Front usually makes an arch with antero-lateral edge. Flagella of second antennæ usually not shut out of orbital gaps.
    i. Second joint of second antennal stalk cylindrical and may or may not reach the front, with which it is not broadly in contact. Endostome ridges vary in shape and size .... *Menippinæ.*
    ii. Second joint of second antennal stalk somewhat irregular in shape and broadly in contact with front. Endostome ridges strong and project on fore edge of mouth......................... *Oziinæ.*
  2. Front at least $\frac{1}{2}$ and fronto-orbital edge more than $\frac{2}{3}$ the greatest breadth of the carapace. Front makes an angle with the antero-lateral edge. Flagella of second antennæ always shut out of orbital gaps.

i. Endostome ridges strong and project on fore edge of mouth .... *Eriphiinæ.*
ii. Endostome ridges moderate and make no projection on fore edge of mouth .... *Trapeziinæ.*

Key to the Subfamilies of the Gonoplacidæ.

I. Last pair of legs present.
 1. Male openings sternal. Eye-stalks almost invariably fixed. Eyes often reduced. Front usually narrow. [Male abdomen does not nearly cover space between last two legs.]
 2. Male openings coxal. Eye-stalks generally movable. Eyes normal. Front broad.
  i. Front occupies whole breadth of carapace.
   (1) Male abdomen does not cover space between last pair of legs .... *Prionoplacinæ.*
   (2) Male abdomen covers space between last pair of legs .... *Gonoplacinæ.*
  ii. Front does not occupy whole breadth of carapace. [Male abdomen covers space between last pair of legs.] .... *Carcinoplacinæ.*
II. Last pair of legs wanting. [Male openings sternal. Male abdomen does not cover space between last pair of legs. Eyes small. Front narrow.] .... *Hexapodinæ.*

Key to the Subfamilies of the Grapsidæ.

I. First antennæ placed in clefts of the front and visible from above. [No oblique line on the third maxillipeds and no wide gap between them. Male abdomen covers the space between the last pair of legs.] ...... *Plagusiinæ.*
II. First antennæ not visible from above.
 1. Third maxillipeds have an oblique hairy line along the ischiopodite and meropodite, and leave a wide gap between them. *Sesarminæ.*
 2. Third maxillipeds have no oblique line.
  i. Front strongly deflexed. A wide gap between the third maxillipeds. Male abdomen covers the space between the last pair of legs .... *Ocypodinæ.*
  ii. Front not strongly deflexed. The gap between the third maxillipeds, if present, is rarely wide. Male abdomen rarely covers space between last pair of legs.. *Varuninæ.*

Key to the Subfamilies of the Ocypodidæ.

I. First antennæ transverse, separated by a narrow septum. Front of moderate breadth. Body shallow, usually quadrilateral and broader than long. [No opening between the bases of the legs.] .... *Macrophthalminæ.*

II. First antennæ oblique or vertical, separated by a broad septum. Front narrow. Body deep.
  1. Body subquadrilateral. Openings fringed with hairs between the bases of the third and fourth pairs of legs................ *Ocypodinæ.*
  2. Body more or less globose. No openings between the legs .... *Myctirinæ.*

LV.—*Descriptions of new Lizards in the British Museum.* By G. A. Boulenger, F.R.S.

Gecko palmatus.

Head large, oviform, much depressed; snout a little longer than the distance between the eye and the ear-opening, once and one third the diameter of the orbit; forehead concave; ear-opening oval, oblique, its greatest diameter about one third that of the orbit. Body and limbs moderately elongate; digits strongly dilated, half-webbed. Snout and supraocular region covered with very small granules, the granules minute on the rest of the head; rostral and first labial entering the nostril; 11 upper and 10 lower labials; symphysial triangular, followed by a pair of chin-shields which are three times as long as broad. Body and limbs covered with minute granules; back with scattered, enlarged, round, flat tubercles, which are about as large as the feebly imbricate ventral scales. Greyish above, mottled with brown, and with brown markings, viz. a dark streak from the eye to the ear and three wavy cross-bars on the body; lower parts white, dotted with brown.

	mm.
Total length	150
Head	22
Width of head	17
Body	58
Fore limb	27
Hind limb	36
Tail (reproduced)	70

A single female specimen from the Man Son Mountains, Tonkin, altitude 3000–4000 feet, collected by Mr. Fruhstorfer.

Prionodactylus Ockendeni.

Snout short; nostril between two nasals; fronto-nasal single; præfrontals forming a median suture; interparietal narrower than the parietals; two rows of occipitals, three in